

ORIGINAL RESEARCH

Validity of Camper's Plane and Its Relevance to Naturally Existing Occlusal Plane

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ABSTRACT

Introduction:The most commonly practiced method of orienting the occlusal plane is to make it parallel to the ala-tragus or Camper's plane. This study was, therefore, undertaken to evaluate the validity of Tragus used in marking "ala-tragus line" while establishing the occlusal plane by measuring the angle between landmarks and their parallelism with occlusal plane.

Aims & Objective:The objective of the study is to evaluate the reliability of the most commonly used extra oral landmark i.e. Ala-tragus line in determination of occlusal plane in edentulous patients by comparing it with dentulous subjects.

Materials& Methods:Lateral cephalograms of Dentulous subjects were taken & were subjected to Cephalometric analysis after tracing. Angles between Ala-tragus line & occlusal plane was measured & subjected statistical analysis.

Conclusion:It was found that Ala-tragus line is not parallel to occlusal plane in natural dentition as an angle exists between the two. However, it can assist in locating the occlusal plane in edentulous patients.

Key words:Ala-tragus line, Camper's Plane, Occlusal Plane.

INTRODUCTION

Clinical determination of the correct occlusal plane is an important procedure for the fabrication of prosthesis as these forms the basis for ideal tooth arrangement, which is essential to develop functional occlusion & acceptable esthetics^[1].

Occlusal plane, anteriorly, helps in developing esthetics & enhancing phonetics while posteriorly, it forms a milling surface, where tongue & buccinator muscle helps in positioning and maintaining the food bolus during mastication.

In the earlier editions of GPT (5th- 8th), the specific part of ala-tragus line was not defined.

Lammie^[2] stated that the occlusal plane should be placed in the position in which it had been situated in the natural dentition previously. This statement is logical since the musculature of the tongue and the cheeks was trained to function normally at this level when the natural teeth were present and will again function correctly when they are called upon to stabilize the bolus at the same vertical position of the occlusal table as formerly existed^[2].

Incorrect/faulty orientation of occlusal plane hampers esthetics, phonetics, mastication & stability of the denture, ultimately causing greater alveolar bone resorption. Faulty orientation of the occlusal plane will jeopardize interaction between tongue and buccinator muscles and

result at one extreme, in food collection in the sulcus, and at the other extreme in biting the cheek and tongue^[3].

A lot of controversies exist regarding the location of the occlusal plane while making of the complete denture. Various landmarks and techniques have been used over the years by clinicians and researchers for establishing this plane.

Various concepts regarding the establishment of the occlusal plane has been postulated such as:

Establishing the occlusal plane according to aesthetic requirements anteriorly and parallel to the ala-tragus line posteriorly^[1-16]; Positioning the occlusal plane parallel to and midway between the residual ridges^[17-19]; Orientating the occlusal plane with the buccinator grooves and the commissure of the lips^[20]; Terminating the occlusal plane posteriorly at the middle or upper third of the retromolar pad^[21]; Positioning the occlusal plane on the same level as the lateral border of the tongue^[21,22]. Many more concepts are reported in literature.

However, the most commonly practiced method of orienting the occlusal plane is to make it parallel to the ala-tragus or Camper's plane. In spite of its widespread acceptability, it is surprising to note the existing vagueness about locating the exact point on tragus to be used while marking ala-tragus line.

This study was, therefore, undertaken to evaluate the validity of Tragus used in marking "ala-tragus line" while establishing the occlusal plane by measuring the angle between landmarks and their parallelism with occlusal plane.

MATERIALS & METHODS

The present study was conducted in the Department of Prosthodontics in association with Department of Oral Medicine & Radiology, Uttar Pradesh Dental College and Research Centre, Lucknow, India. As this was an in vivo study, approval from the institutional ethical committee was taken.

For the study, 50 dentulous subjects were selected. An informed consent from the patient was taken.

CRITERIA FOR SELECTION OF DENTULOUS SUBJECTS

- Permanent dentition with normal arch form & alignment.
- Angle's Class I molar relation.
- Normal tooth form.
- Minimal attrition.
- No history of orthodontic treatment.
- No history of trauma.
- No Class II restorative treatment.
- No inlay, onlay, crown or fixed partial denture.

The dentulous subjects were asked to close the mandible in maximum intercuspation position and were positioned and adjusted with Cephalostat (5 feet away from x-ray source), standard procedure followed while taking lateral cephalograms. Ear rods were positioned in the external auditory meatus; nasal positioner was locked & secured against the bridge of the nose to eliminate the rotation around the ear rods in sagittal plane. X-ray cassette was placed 15 cm away from the midline of the subject's face and then lateral cephalographs was taken at this distance with medium speed cassette and medium speed film with 0.8 second at 80 kVp and 10 mA value. X-ray beam projecting perpendicular to the midsagittal plane of the subjects was centered over the external auditory meatus. Developing and fixing of the film was done by using standard technique.

The acetate paper of 36 μ thickness of 8"×10" size was positioned over the cephalographs and fixed in position by using the adhesive tape. Good quality X-ray viewer was used to evaluate

the cephalograph. The selected points were marked on tracing paper using sharp micro tip 3H lead pencil on a view box using transilluminated light in a dark room.

Two lines were marked (Fig.1):

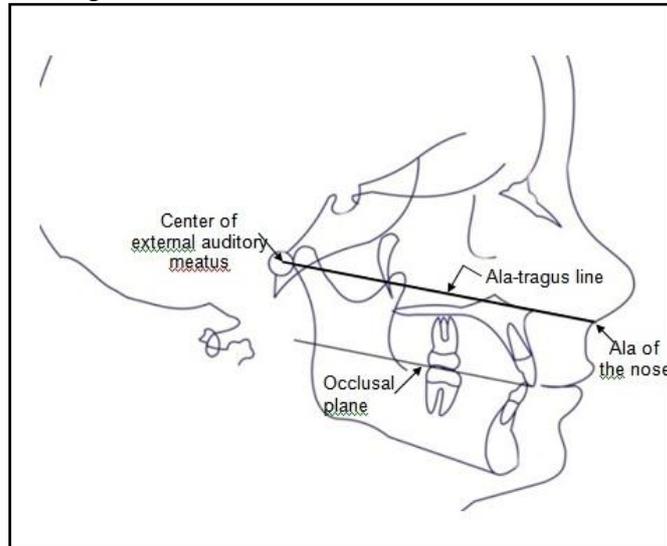


Fig.1: Diagrammatic representation of landmarks used in the study

1. Ala-tragus line was marked on the tracing paper from the lower border of the ala of the nose to the center of the external auditory meatus.
2. Occlusal plane was marked from the point mid-way between the incisor tips of the maxillary and mandibular incisors to the point mid-way between mesio-buccal cusps of maxillary and mandibular first molar. Angle, if any, between both the lines was measured with the help of protractor.

The angular variability in occlusal plane and ala-tragus line was measured in all 50 subjects. The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 15.0 statistical Analysis Software. The values were represented in Number (%) and Mean \pm SD.

OBSERVATIONS & RESULTS

Observation of data obtained from dentulous subjects reveals an angular variability between ala-tragus line and occlusal plane amongst dentulous subjects to be in the range of 0 to 7° with a mean value of 3.38° and a standard deviation of 2.03°(Table 1).

Table 1: One-Sample Kolmogorov-Smirnov Test (Dentulous subjects)

		Dentulous
N		50
Normal Parameters(a,b)	Mean	3.38
	Std. Deviation	2.032
Most Extreme Differences	Absolute	0.151
	Positive	0.151
	Negative	-0.107
Kolmogorov-Smirnov Z		0.757
Asymp. Sig. (2-tailed)		0.615

- a. Test distribution is Normal.
- b. Calculated from data.

Table 2: Mean Angular Variability between Ala-Tragus line and occlusal plane in dentulous subjects

S.No.	Group	n	Mean	SD
1.	Dentulous	50	3.38	2.03

c. "t" $=$ 1.606, $p=$ 0.115

On evaluating the distribution for normalcy, using the Q-Q plot and Kolmogorov-Smirnov test, no significant difference between expected and observed values of distribution was observed ($p=$ 0.615) thereby indicating the distribution to be normal.

On evaluating the distribution for normalcy, using the Q-Q plot and Kolmogorov-Smirnov test, no significant difference between expected and observed values of distribution was observed ($p=$ 0.813) thereby indicating the distribution to be normal.

RESULTS

In this study, the middle of the tragus was used as a reference point in marking ala-tragus line for establishing occlusal plane in edentulous patients. The angles measured between occlusal plane and ala-tragus line were evaluated using lateral cephalograms. The results of this study were subjected for statistical analysis.

The results of the study are as follows:

1. The results obtained give the inference that the angular variability between ala-tragus line and occlusal plane.
2. Extent of variability between ala-tragus line and occlusal plane was found to be in the range of 0 to 7° in dentulous subjects.
3. The clinical significance of this variability is helpful in establishing the technique as a reliable method.

DISCUSSION

Use of ala-tragus line for orientation of the plane of occlusion is one of the “oldest, simplest and most commonly” used method. But, varying definitions of the ala-tragus line has created confusion.

The result of the present study is in agreement with the previous studies performed by H.C. Karkazis & G.L. Polyzois¹¹, R.H. Augsburger¹⁸, Richard K.K. and S.K. Djeng^[16,26], Subhas et al.^[28] who stated that the ala-tragus line marked between the lowest point of the ala of the nose and the middle part of the tragus is the most suitable and acceptable guide for establishing nearly correct occlusal plane while recording jaw relation for developing occlusion for complete dentures.

Varying observations have been obtained by researchers with values ranging between +2.1 & +8.2 and the reason for which could be attributed to the use of different occlusal planes.

The clinical implication of this study is, therefore, significant and helpful in demonstrating the usefulness of using the middle part on tragus as a most appropriate reference point while marking ala-tragus line during establishing the occlusal plane in edentulous subjects. This will help in establishing prosthodontic occlusion which will be within acceptable limits of its previous position and will add to the quality of stability of prosthesis, restoring functions and also, will definitely increase the level of confidence and comfort to the patient.

Various studies have been done to decide upon the tragus marking but have come up with varying results. A majority of published literature^[8,9,11,12,14,16,17,18,19,25,26,27] supports the use of middle of the tragus for marking ala tragus line and the angles obtained have either been positive or negative.

The location of soft tissue landmarks is a subjective assessment which is vulnerable to variability from operator to operator and is extremely difficult to locate and measure. The

above results are presented with the knowledge that some errors might have been incorporated. However, a determined effort was made to reduce the errors to minimal.

Therefore, no conclusive inference can be drawn due to subjective errors such as (1) the difficulty of deciding the different reference points, (2) the error in transposing the lines for measuring the angles, and (3) the error in measuring the angles. Another group of factors influencing the ranking of exactness with which the angles can be determined consists of biologic factors such as growth, variability of anatomy between different populations & soft tissue changes with aging etc.

The observation of the present study is in agreement to the previous studies ^[11,16,18,26] supporting the use of ala-tragus plane for reestablishing the occlusal plane in complete denture patients. Although no conclusive data exists stating that ala-tragus line is parallel to the natural occlusal plane, but over the years it has proved to be reliable reference especially for less experienced dentist who is not accustomed to using intraoral reference points when the maxillary wax rim is trimmed to the occlusal plane ^[11]. Proposed intraoral guides such as retromolar pad, lateral borders of the tongue, bisected space between residual alveolar ridges can only assist and even discrepancy of 1mm while marking can change the plane by 0.5°.

CONCLUSION

Based on the observations made, statistical analyses and discussion the following conclusions were drawn:

1. Ala-tragus line is not parallel to occlusal plane in natural dentition as an angle exists between the two.
2. Ala-tragus line cannot be used as reliable predictor for marking occlusal plane.
3. Ala-tragus line can assist in locating the occlusal plane.

When constructing complete dentures, the location of the occlusal plane should depend on mature clinical judgment of the individual dentist and must satisfy aesthetics, denture stability, function and comfort of the patient.

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